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BIONOMIC NOTES ON MENECLES INSERTUS (SAY) (HEMIPTERA, PENTATOMIDAE).[1]

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This comparatively little-known stink bug possesses two behavioristic features that are somewhat unusual in the Pentatomidae, namely its nocturnal activity and its migrations up and down tree trunks. Only fractional contributions toward a knowledge of its life cycle have been made. My notes add some personal observations and summarize briefly the bionomic data from the literature.

Menecles insertus was described as *Pentatoma inserta* by Thomas Say in 1831. The original description is reproduced in LeConte's The Complete Writings of Thomas Say on the Entomology of North America. Stål erected the genus *Menecles* in 1867 and transferred *insertus* to it: it is a monotypic group.

Nocturnal and Arboreal Behavior. Van Duzee (1904) obtained it in numbers from small hickory trees growing near Lewiston, New York. This seems to be the first published indication of its relation to trees. Since he mentioned neither stage nor time, I presume Van Duzee collected adults during the day, perhaps while they remained inactive under loose bark on the tree trunks. Hart mentioned the "arboreal habits" of *insertus* and reported it "very abundant . . . under a row of hard maple trees, which it was presumably leaving for hibernation." It is not entirely clear from these notes whether Hart or his collaborators had personally found the bug on trees. But Blatchley states definitely he had three individuals from the bole of a beech tree in a dense woodland near Indianapolis, and single ones "on the boles of trees, dead leaves, corded wood or some objects of dull hue with which the color blended."

[1] Contribution No. 247 from the Entomological Laboratories of the University of Illinois. I am indebted to Doctor Charles O. Esselbaugh for permission to quote from his unpublished notes and for help with references to publications.

The nocturnal studies made by Park and Strohecker in a forest in northern Indiana not only showed that *insertus* is active at night and inactive by day, but that its nightly movements are vertical and largely limited to living trees. They found it crawling from beneath the leaf mold at the bases of stump and tree and beginning their ascent by 9: 10 P.M. (probably C. S. T.). They appeared in great numbers throughout the night. By midnight they had moved from 8 to 15 feet or more up on the tree trunks and foliage, and by 3: 20 A.M. were moving down again. At 4: 23 they were on the average from six to eight feet above the forest floor, and at 5: 00 o'clock the majority had crawled once more under the mold and debris, while stragglers remained two to four feet up on the trunk.

That *insertus* is not continuously arboreal but spends the night on trees and the day under cover on or near the ground has been shown in the above statement modified from Park and Strohecker and by other observers. Stoner found 23 individuals under cover on the ground in wooded or semi-wooded districts at Iowa City. While Esselbaugh obtained specimens "in the open during broad daylight," he also found individuals under leaf mould.

On June 19, 1932, I discovered an aggregation of 95 individuals in a woods along the Salt Fork River south of Oakwood in Vermilion County, Illinois. It was full daylight and the bugs were concealed under the loose bark in its natural position on an old but still firm log lying on the ground near a number of living trees. The log measured about 10 feet long and 10 inches thick. All the 95 bugs captured were adults excepting one, which was a nymph in its last instar. Fifty of the adults were females, and 44 males. Near this site, I secured three females under leaves on April 12, 1936. Again, while collecting *Collembola* on the floor of Brownfield's Woods near Urbana on July 14, 1941, I sifted an adult and a mature nymph from dead leaves raked from the ground. These were secured near midday and several yards from trees or logs. In the same month, my attention was directed to a hackberry tree in this woods where a class in ecology had found numbers of this insect several days previously. On July 18, my daytime search among the dead leaves at the base of this tree revealed 27 adults and one mature nymph. All were inactive and hiding under the uppermost dead leaves that formed the cover of the woods floor; none had descended to the underlying soil. The majority occurred within four feet from the bole, and, with few exceptions they appeared west of the tree. Another adult was discovered at the

base of an elm near the hackberry. Their color blends closely with that of old leaves, and they moved but slowly when disturbed.

Whether the vertical nocturnal movements alternate regularly and daily with a diurnal period of inactivity at the bases of trees, or these two phases of behavior occur at irregular intervals, has not been made known. It also has not been pointed out or observed whether the nymphs participate in this alternating vertical day–night activity.

Food. The above suggestion that *insertus* remains inactive under debris on the ground during the day implies, correctly or erroneously, that it feeds during the night while on the boles, branches or leaves of standing living trees. However, Kirkland included this bug among a number of Hemiptera that prey, presumably on the larvae, of the gypsy moth, *Porthetria dispar* (Linn.). Olsen and Stoner have quoted Kirkland. There are three reasons why this statement is probably incorrect: first, subsequent investigators on the gypsy moth have not, so far as I know, verified the alleged predatism; second, *insertus* is not a member of the predatory subfamily Asopinae, and third, its occurrence in large concentrated numbers precludes the likelihood that sufficient insect life occurs in the trees to sustain the species. I anticipate that both nymphs and adults will be found to suck sap from the stems, branches, or leaves of the living trees. If so, it appears to feed on trees of diverse relationship for it has been found associated with elm and hackberry (Balduf), beech (Blatchley), hard maple (Hart) and hickory (Van Duzee, 1904).

Life Cycle. The pieces of information at hand indicate that *insertus* hibernates as adult, as other Pentatomidae do. It was found "very abundant" in late October and early November on sidewalks under a row of maples on the University Campus at Urbana, and was presumed to be leaving the trees for hibernation (Hart). All but four of the 23 individuals recorded by Stoner from Iowa City were taken in November and mostly under the leaves of hickory or elm in wooded places. One of the four was "a hibernating form taken May 11": a half-grown nymph was found September 24 and the other two were obtained October 24. Blatchley stated "it probably hibernates as imago as a single example was taken October 17 from beneath a half buried log." Esselbaugh secured hibernating individuals beneath a rather thick layer of dead leaves in a woodland near Urbana, and the first active bug was taken on April 15 on a tree trunk on the University Campus.

The number of generations developed in a year is still suppositious. Little is reported concerning nymphs, and still less about the eggs. Esselbaugh caged one female and secured three egg masses in three successive days in early June. Whether the eggs are laid in nature by day among the dead leaves on the ground or by night on the bark or leaves of the living trees, or in both situations, remains unknown. Esselbaugh also succeeded in rearing the nymphs, but only one attained the fifth instar. Hart reported that nymphs occurred in June in Illinois. Therefore, unless the yearly developmental pattern contains a dispause, a second cycle can perhaps be completed here. Stoner found a half-grown nymph on September 24 and I discovered mature ones on June 19 and July 14 and 18. Further studies are needed before the significance of these four cases can be stated.

Distribution. While known to occur in places so widely separated as Ontario and Arizona, and Massachusetts and California, *M. insertus* has been reported from only a small proportion of the states. Its nocturnal and arboreal behavior, and what appears to be a tendency toward gregariousness, probably render the species less susceptible to collecting and explain the consequent spotty picture of distribution. It seems certain that it occurs also in many other states. Van Duzee (1917) reported it for Ontario, Massachusetts, New Jersey, Pennsylvania, Ohio, Illinois, Missouri, Nebraska, Kansas, Arkansas, Arizona and California. Olsen had it from Rockaway Beach, Long Island, New York; Blatchley found it in seven counties of Indiana on or south of the east-west line through Indianapolis, while Park and Strohecker observed it in northern Indiana. Blatchley also recorded it from Hopkinton, Massachusetts (Frost) and Raleigh, North Carolina (Brimley manuscript). The collection of the Illinois State Natural History Survey contained specimens from the northern, central and southern parts of the state (Hart), and the collection of the University has more than 100 specimens from the area of Urbana. Stoner found it at Iowa City, Iowa. The fact that Say received one of the type specimens from Thomas Nuttall, the English botanist, is noteworthy. Nuttall had it from Arkansas, presumably in the year 1818–1819, when he ascended the Arkansas River from the Mississippi (Pennell).

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An Instance of Sonification in Lepidoptera.—Sonification is not usually associated with Lepidoptera. A reminder that it does occur is contained in an interesting observation made in Mexico by Major George Miksch Sutton. Writing in the Audubon Magazine (Nov.-Dec. 1944, p. 347) he comments on a butterfly which produced a clicking sound with its wings.

This is a peculiarity of the neotropical genus *Ageronia* Hübner in the Nymphalinae, a species of which, *A. fornax* Hübner, has been recorded from the warmer sections of Texas, according to Dr. W. J. Holland. *A. feronia* Linnaeus may also be found there. Major Sutton described the butterfly he observed as checkered gray and white, a rapid flyer with a habit of alighting on tree trunks and facing head downward, all characteristics of the genus *Ageronia*.—Rowland R. McElvare, Port Washington, Long Island, N. Y.